Federal Highway Administration
Recommended Framework for a Bridge Inspection QC/QA Program

Introduction:

23 CFR 650.313(g) Quality Control and Quality Assurance requires each state to assure that systematic Quality Control (QC) and Quality Assurance (QA) procedures are being used to maintain a high degree of accuracy and consistency in the inspection program. Accuracy and consistency of the data is important since the bridge inspection process is the foundation of the entire bridge management operation and bridge management systems. Information obtained during the inspection is used for determining needed maintenance and repairs, for prioritizing rehabilitations and replacements, for allocating resources, and for evaluating and improving design for new bridges. The accuracy and consistency of the inspection and documentation is vital because it not only impacts programming and funding appropriations, it also affects public safety. Therefore, the FHWA has developed the following recommended framework for a bridge inspection QC/QA program.

A. Documentation of QC/QA Program:

1. Develop, document, and maintain a bridge inspection manual that contains Quality Control/Quality Assurance (QC/QA) procedures in accordance with this recommended framework.
2. Elaborate on the purpose and benefits of the QC/QA program.
3. Provide appropriate definitions.

B. Quality Control (QC) Procedures

1. Define and document QC roles and responsibilities.
2. Document qualifications required for Program Manager, Team Leader, Inspection Team Member and Load Rater.
3. Document process for tracking how qualifications are met, including:
   a. Years and type of experience.
   b. Training completed.
   c. Certifications/registrations.
4. Document required refresher training, including:
   a. NHI training courses, other specialized training courses, and/or periodic meetings.
   b. Define refresher training content, frequency, and method of delivery.
5. Document special skills, training, and equipment needs for specific types of inspections.
6. Document procedures for review and validation of inspection reports and data.
7. Document procedures for identification and resolution of data errors, omissions and/or changes.

C. Quality Assurance (QA) Procedures

1. Define and document QA roles and responsibilities.
2. Document procedures for conducting office and field QA reviews, including:
    a. Procedures for maintaining, documenting, and sharing review results; including an annual report.
    b. Establish review frequency parameters. Parameters should include:
        i. Recommended review frequency for districts/units to be reviewed (e.g. review each district once every 4 years). Or establish number of districts/units to be reviewed annually.
        ii. Recommended number of bridges to review.
    c. Procedures and sampling parameters for selecting bridges to review. Procedure should consider:
        i. Whether the bridge is or is not posted.
        ii. Bridge's deficiency status.
        iii. Whether the bridge is programmed for rehab or replacement.
        iv. Whether the bridge has had critical findings and the status of any follow-up action.
        v. Bridges with unusual changes in condition ratings (e.g. more than 1 appraisal rating change from previous inspection).
        vi. Bridges that require special inspections (underwater, fracture critical, other special).
        vii. Location of bridge.
    d. Procedures for reviewing current inspection report, bridge file, and load rating.
    e. Procedures to validate qualifications of inspector and load rater.
    f. Define "out-of-tolerance" for condition rating and load rating. (e.g. rating of +/- 1 or load ratings that differ by more than 15%)
    g. Checklists covering typical items to review as part of QA procedures.
        i. Bridge file.
        ii. Field inspection.
        iii. Load rating analysis.
    h. Others.
3. Document disqualification procedures for team leaders and consultant inspection firms that have continued record of poor performance.
4. Document re-qualification procedures for previously disqualified team leaders and consultant inspection firms that demonstrate they have acceptable performance.
5. Document procedures for conducting inspections on a "control" bridge.
6. Document procedures to validate the QC procedures.

Commendable State Practices:

The following states have existing QC/QA procedures that address specific aspects of the "Recommended Framework" in a manner the FHWA considers commendable.

A. Pennsylvania DOT

1. Purpose and benefits of QC/QA program. (A.2)
2. In general, the QC/QA procedures are comprehensive and an excellent example. (A, B, & C)

B. Oklahoma DOT

1. Document procedures for conducting inspections on a "control" bridge. (C.5)
2. Document disqualification procedures for team leaders and consultant inspection firms that have continued record of poor performance. (C.3)
3. Document re-qualification procedures for previously disqualified team leaders and consultant inspection firms that demonstrate they have acceptable performance. (C.4)

C. Wisconsin DOT

1. Define and document QA roles and responsibilities. (C.1)
2. Checklists covering typical items to review as part of QA procedures. (C.2.g.)
3. Document procedures for conducting office and field QA reviews. (C.2)
4. Establish review frequency parameters. (C.2.b)
5. Procedures and sampling parameters for selecting bridges to review. (C.2.c,)
6. Procedures to validate qualifications of inspectors and load raters. (C.2.e.)

D. Oregon DOT

1. Checklists covering typical items to review as part of QA procedures: ODOT provides a checklist of sorts for the QA team's independent inspection of each bridge during the field review. It allows the QA team to see their ratings (NBI and element level) side-by-side with the last inspection ratings for easy comparison. (C.2.g.)
2. Procedures and sampling parameters for selecting bridges to review: ODOT does a good job on their related section "Field Review." They list characteristics of bridges (conditions, age, number, etc.) that should be used as selection criteria for bridges to be included in the field review. (C.2.c.)
3. Purpose and benefits of QC/QA program: ODOT does an excellent and thorough job at explaining why accurate bridge inspection data is vital to the transportation system and to public safety. (A.2)

E. Massachusetts Highway Department

1. Define and document QC roles and responsibilities. (B.1.)
2. Define and document QA roles and responsibilities. (C.1.)
3. Definitions: “QC: Checks necessary to maintain a uniform level of quality.” (A.3.)
4. Definitions: “QA: An independent evaluation of a service to establish that a prescribed level of quality has been met.” (A.3.)

F. Washington DOT

1. Develop, document, and maintain a bridge inspection manual that contains Quality Control/Quality Assurance (QC/QA) procedures: WSDOT has a bridge inspection manual that contains documented QA procedures. (A.1.)
2. Document qualifications required for Program Manager, Team Leader, Inspection Team Member and Load Rater: WSDOT documents the qualifications required for Head of the Organization, Lead Inspector and Assistant Inspector. All load ratings are stamped, signed and dated by a registered professional engineer. (B.2.)
3. Document process for tracking how qualifications are met: WSDOT has a bridge inspector experience and training record (document), which is maintained for each inspector. This document includes education, professional registration, bridge inspection training, special technical course, and bridge inspection experience. Each qualified inspector receives a bridge inspector identification number, which must be placed on the signed inspection report. (B.3.)
4. Document special skills, training, and equipment needs for specific types of inspections: WSDOT documents general equipment, special equipment and access equipment needed for inspections. (B.5.)
5. Document procedures for identification and resolution of data errors, omissions and/or changes: WSDOT processes their data through their WSBIS system that identifies errors that must be reconciled and resubmitted. (B.7.)
6. Define and document QA roles and responsibilities: WSDOT defines and documents QA roles for WSDOT for State Inspected Bridges and WSDOT for bridges inspected by local agencies. (C.1.)
7. Document procedures for conducting office and field QA reviews: Procedures are well documented for WSDOT QA of bridges inspected by locals. Field and office reviews are conducted. Random sample of routine and UBIT inspections are field reviewed for state bridges. Each local agency receives a WSDOT QA review at least every three years. Each region receives a WSDOT QA review by the regional bridge inspection engineer. Checklist of items to be reviewed is documented for WSDOT QA reviews of local agencies that include current inspection report, load rating and validation of qualified inspectors. (C.2.)

Available Resources:

A. Relevant references in the NBIS Regulation:

23 CFR 650.305 Definitions

Quality assurance (QA). The use of sampling and other measure to assure the adequacy of quality control procedures in order to verify or measure the quality level of the entire bridge inspection and load rating program.

Quality control (QC). Procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level.

23 CFR 650.313(g) Quality Control and Quality Assurance

Assure systematic quality control (QC) and quality assurance (QA) procedures are used to maintain a high degree of accuracy and consistency in the inspection program. Include periodic field review of inspection teams, periodic bridge inspection refresher training for program managers and team leaders, and independent review of inspection reports and computations

B. FHWA Personnel:

HIBT (Tom Everett, Gary Moss), RC (Shay Burrows, Larry O'Donnell, Doug Edwards)

C. HIBT Website: http://www.fhwa.dot.gov/bridge/nbis.htm

D. RC FTP Site:

Several existing QC/QA plans are available for download at the following FTP site:

ftp://fhwaftp.fhwa.dot.gov/MWRC/BridgeManagement/Bridge_Inspection/QCQA/

Username: mwrcguest
Password: mwrcguest